Learner Guide
Primary Agriculture

Rational and irrational numbers and number systems

My name: ....................................................
Company: .....................................................
Commodity: ......................... Date: .................

The availability of this product is due to the financial support of the National Department of Agriculture and the AgriSETA. Terms and conditions apply.
Dear Learner - This Learner Guide contains all the information to acquire all the knowledge and skills leading to the unit standard:

Title: Demonstrate understanding of rational and irrational numbers and number systems
US No: 7480  NQF Level: 2  Credits: 3

The full unit standard will be handed to you by your facilitator. Please read the unit standard at your own time. Whilst reading the unit standard, make a note of your questions and aspects that you do not understand, and discuss it with your facilitator.

This unit standard is one of the building blocks in the qualifications listed below. Please mark the qualification you are currently doing:

<table>
<thead>
<tr>
<th>Title</th>
<th>ID Number</th>
<th>NQF Level</th>
<th>Credits</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Certificate in Animal Production</td>
<td>48976</td>
<td>2</td>
<td>120</td>
<td>☐</td>
</tr>
<tr>
<td>National Certificate in Mixed Farming Systems</td>
<td>48977</td>
<td>2</td>
<td>120</td>
<td>☐</td>
</tr>
<tr>
<td>National Certificate in Plant Production</td>
<td>48975</td>
<td>2</td>
<td>120</td>
<td>☐</td>
</tr>
</tbody>
</table>

Please mark the learning program you are enrolled in:

Your facilitator should explain the above concepts to you.

This Learner Guide contains all the information, and more, as well as the activities that you will be expected to do during the course of your study. Please keep the activities that you have completed and include it in your Portfolio of Evidence. Your PoE will be required during your final assessment.

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What is assessment all about?

You will be assessed during the course of your study. This is called formative assessment. You will also be assessed on completion of this unit standard. This is called summative assessment. Before your assessment, your assessor will discuss the unit standard with you.

Assessment takes place at different intervals of the learning process and includes various activities. Some activities will be done before the commencement of the
program whilst others will be done during programme delivery and other after completion of the program.

The assessment experience should be user friendly, transparent and fair. Should you feel that you have been treated unfairly, you have the right to appeal. Please ask your facilitator about the appeals process and make your own notes.

**How to use the activity sheets...**

Your activities must be handed in from time to time on request of the facilitator for the following purposes:

- The activities that follow are designed to help you gain the skills, knowledge and attitudes that you need in order to become competent in this learning module.

- It is important that you complete all the activities and worksheets, as directed in the learner guide and at the time indicated by the facilitator.

- It is important that you ask questions and participate as much as possible in order to play an active roll in reaching competence.

- When you have completed all the activities and worksheets, hand this workbook in to the assessor who will mark it and guide you in areas where additional learning might be required.

- You should not move on to the next step in the assessment process until this step is completed, marked and you have received feedback from the assessor.

- Sources of information to complete these activities should be identified by your facilitator.

- **Please note** that all completed activities, tasks and other items on which you were assessed must be kept in good order as it becomes part of your **Portfolio of Evidence** for final assessment.

**Enjoy this learning experience!**
How to use this guide …

Throughout this guide, you will come across certain re-occurring “boxes”. These boxes each represent a certain aspect of the learning process, containing information, which would help you with the identification and understanding of these aspects. The following is a list of these boxes and what they represent:

**What does it mean?** Each learning field is characterized by unique terms and definitions – it is important to know and use these terms and definitions correctly. These terms and definitions are highlighted throughout the guide in this manner.

**Activity**

You will be requested to complete activities, which could be group activities, or individual activities. Please remember to complete the activities, as the facilitator will assess it and these will become part of your portfolio of evidence. Activities, whether group or individual activities, will be described in this box.

**Examples**

Examples of certain concepts or principles to help you contextualise them easier, will be shown in this box.

**How am I doing?**

The following box indicates a summary of concepts that we have covered, and offers you an opportunity to ask questions to your facilitator if you are still feeling unsure of the concepts listed.

**My Notes …**

You can use this box to jot down questions you might have, words that you do not understand, instructions given by the facilitator or explanations given by the facilitator or any other remarks that will help you to understand the work better.
What are we going to learn?

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SAQA Unit Standard
Learner Tips

There are many activities for this Module. Get organised before you begin, by making sure you have a folder to organise your completed written work into a Portfolio of Evidence.

♦ As you read through the module, make your own notes. Keep all your notes in a file. They will be useful in later modules and for your assessment activities.
♦ Keep a simple journal about what you are learning. Each week, write comments about the course, about what you are learning and whether or not you are finding it useful.
♦ Talk to your facilitator about any difficulties you are having with information or ideas. Your facilitator is a learning resource for you.
♦ Throughout this course think about your own experiences as much as possible. Try to relate what you are learning to your own real life experiences. This will make the course more meaningful for you.

What will I be able to do?

When you have achieved this unit standard, you will be able to:

♦ Use and analyse computational tools and strategies, and make estimates and approximations
♦ Demonstrate understanding of numbers and relationships among numbers and number systems, and represent numbers in different ways.

What do I need to know?

It is expected of the learner attempting this unit standard to demonstrate competence against the unit standard:

♦ Mathematics and Communications at NQF level 1.
Introduction

In this Learning Guide, you will cover the content and skills you need to master the following learning outcomes:

♦ Explain where rational and irrational numbers fit into the number system.
♦ Understand the differences and similarities of rational and irrational numbers.
♦ Carry out calculations with rational and irrational numbers.
♦ Work with percentages, common fractions, decimals fractions, exponential notation.
♦ Convert common fractions to decimal fractions
♦ Write rational numbers in exponential notation
♦ Calculate and justify procedures when calculating
♦ Convert very large and very small numbers to scientific notation
♦ Apply the mathematical principles involved when applying scientific notation
Demonstrate understanding of rational and irrational numbers and number systems

Primary Agriculture  
NQF Level 2  
Unit Standard No: 7480

1 Rational and Irrational Numbers

After completing this session, you should be able to:

SO 1: Use and analyse computational tools and strategies, and make estimates and approximations.

In this session we explore the following concepts:

♦ Explain where rational and irrational number fit in to the number system
♦ Understand the differences and similarities of rational and irrational numbers
♦ Carry out calculations with rational and irrational numbers

In this session we will lay the foundation for understanding rational and irrational numbers as well as the principles and methods involved in calculating rational and irrational numbers

My Notes ...

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1. **Number Systems**

   a) **Natural Numbers**

   Natural numbers are all numbers that start at 1 and include all subsequent whole numbers and ends in infinity.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>1; 2; 3; 4; 5; 6; 7; 8;...</td>
</tr>
<tr>
<td>Starts at</td>
<td>1</td>
</tr>
<tr>
<td>Excludes</td>
<td>0; fractions; negative numbers</td>
</tr>
<tr>
<td>Ends in</td>
<td>Infinity</td>
</tr>
</tbody>
</table>

   b) **Whole Numbers**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>N₀ or W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>0; 1; 2; 3; 4; 5; 6; 7; 8;...</td>
</tr>
<tr>
<td>Starts at</td>
<td>0</td>
</tr>
<tr>
<td>Excludes</td>
<td>Fractions, negative numbers</td>
</tr>
<tr>
<td>Ends in</td>
<td>Infinity</td>
</tr>
</tbody>
</table>

   c) **Integers**

   Numbers are divided into two main areas i.e. negative integers and positive integers.

   Negative integers can be related to debts or the ‘owing to’ part in everyday life and positive numbers are generally common to natural (counting) numbers.

   The ‘Bank of Africa’ uses negative and positive integers to show you what transaction you have done.

   **BANK OF AFRICA**

   22/10/00 11H57
   Balance + 500.00
   Withdrawal - 100.00
   Deposit + 200.00
   Withdrawal - 100.00
   Balance + 500.00
Zero plays an important role in dividing the negative and positive integers and is neither negative nor positive.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>... -4; -3; -2; -1; 0; 1; 2; 3; 4; ...</td>
</tr>
<tr>
<td>Includes</td>
<td>Negative numbers into infinity</td>
</tr>
<tr>
<td>Excludes</td>
<td>Fractions</td>
</tr>
<tr>
<td>Ends in</td>
<td>Infinity</td>
</tr>
</tbody>
</table>

**d) Rational Numbers**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>( \frac{a}{b} ) where ( a ) and ( b ) are elements of the range of integers and ( b \neq 0 )</td>
</tr>
<tr>
<td>Example</td>
<td>( \frac{1}{2}; \frac{7}{8}; \frac{1}{3}; 0.25; 0.892430 )</td>
</tr>
<tr>
<td>Includes</td>
<td>0, Negative integers and fractions</td>
</tr>
<tr>
<td>Excludes</td>
<td>Any number divided by zero and non-repeating decimals</td>
</tr>
<tr>
<td>Ends in</td>
<td>Infinity</td>
</tr>
</tbody>
</table>

**My Notes ...**

...
e) Irrational Numbers

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Q'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>All</td>
</tr>
<tr>
<td>Example</td>
<td>$\frac{22}{7}$; $\sqrt{3}$</td>
</tr>
<tr>
<td>Includes</td>
<td>Non-repeating decimals</td>
</tr>
<tr>
<td>Excludes</td>
<td>Any number divided by zero</td>
</tr>
<tr>
<td>Ends in</td>
<td>Infinity</td>
</tr>
</tbody>
</table>

f) Real Numbers

When rational numbers are combined with irrational numbers, a big set of numbers occurs, which is what we call real numbers. This means that all numbers that exist in our universe come from the big set of real numbers.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>$\mathbb{R}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Includes</td>
<td>All</td>
</tr>
<tr>
<td>Excludes</td>
<td>Nothing</td>
</tr>
<tr>
<td>Ends in</td>
<td>Infinity</td>
</tr>
</tbody>
</table>

g) Working with Rational Numbers

h) The four operations

So far, we are able to deal with the basic calculations i.e.:

- adding numbers to get the sum
  \[5 + 6 = 11\]

- subtracting numbers to get the difference
  \[18 - 6 = 12\]

- multiplying numbers to get the product
  \[12 \times 3 = 36\]

- dividing numbers to get the quotient
  \[90 \div 9 = 10\]
i) **Estimation**

In mathematics it is always good practice to first estimate the answer and if you then require the correct answer, you can apply the formal calculation process.

**For example:**

Joe wants to buy a few things from the supermarket. He walks down the first aisle and buys a tin of coffee for R27.95, a box of tea for R13.78 and in the second aisle he buys a packet of sugar for R10.95. He knows he has R50 in his wallet. He quickly adds up the rounded off figures to estimate the total. (Coffee R28 + Tea R14 + Sugar R11 = ±R53) Will he have enough money? No.

If he added the correct amounts without rounding them off, he would need exactly R52.68. Joe goes back to the coffee aisle and just as he wants to put back the tin of coffee he sees a R2 discount voucher on the shelf for the brand of coffee he has bought. He takes one, because he now will only need ±R51. He goes to where the tea is and sees that a different brand of tea will cost him R11.95. He takes the cheaper brand and puts back the box of tea he had. He quickly adds up the amounts, once again rounding them off ([R28 - R2] + R12 + R11 = R49). Now he has enough money. At the cashier he pays the amount of R48.85. His estimation was close enough for the purpose.

j) **Using a calculator**

It is convenient and quick to use a calculator, but a calculator is absolutely no use if you cannot quickly perform calculations and/or estimate whether the calculator is correct.

The calculator will give you answers to problems that you put in. If you press the wrong number and you cannot estimate whether the answer is correct or not, your answer will be wrong.

Be careful when using a calculator and do not depend on it as the answer to all your problems.

It is advisable that each person has his own calculator. Do not spend hundreds of rands on a calculator. The cheap ones often do the same work better than the more expensive ones.

When buying a calculator, check whether it works properly by pressing 12345 679 x 54. If your answer is 6,666,666E, then you know that the calculator is working properly.
Demonstrate understanding of rational and irrational numbers and number systems

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The Keys on the Calculator.

- Percentage
- Square Root
- Clear All
- Memory Buttons
- Digits
- Switch On
- Screen or display
- Division
- Multiplication
- Subtraction
- Equals
- Addition
- Decimal Point

Some calculators can be switched on by pressing the CA button (top right). It will automatically switch off when it hasn't been used for a while.
Demonstrate understanding of rational and irrational numbers and number systems

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ADDITION

Press 2 4 + 1 6 -

What is your answer?

If your answer is correct, press CA to clear the operation before you continue with the next calculation.

SUBTRACTION

Press 5 7 - 2 4 =

What is your answer?

If your answer is correct, press CA to clear the operation before you continue with the next calculation.

MULTIPLICATION

Press 8 7 x 1 4 -

What is your answer?

If your answer is correct, press CA to clear the operation before you continue with the next calculation.

DIVISION

Press 5 0 0 ÷ 2 5 =

What is your answer?

If your answer is correct, press CA to clear the operation before you continue with the next calculation.

FRACTIONS

\[
\frac{5}{8} = 5 \div 8 =
\]

What is your answer?

If your answer is correct, press CA to clear the operation before you continue with the next calculation.
DECIMALS
A point has replaced the decimal comma, which is usually used to identify decimals on the calculator.

Press \( 0 \cdot 6 3 + 0 \cdot 7 5 = \)

What is your answer?

If your answer is correct, press CA to clear the operation before you continue with the next calculation.

PERCENTAGE
To calculate 15% of 80 on your calculator,

Press \( 8 0 \times 1 \ 5 \% = \)

What is your answer?

If your answer is correct, press CA to clear the operation before you continue with the next calculation.

To calculate VAT (14%) on R56-00,

Press \( 5 6 \times 1 \ 4 \% = \)

What is your answer?
Do not clear the calculation, but continue

Now to add the VAT to the Rand amount,

Press \(+ \) and then \( =\)

Round off the figure after the decimal to the nearest 100th (2 places to the right of the decimal comma).

If your answer is correct, press CA to clear the operation before you continue with the next calculation.
k) Principles involved when calculating with rational numbers

We can multiply and even divide integers with each other. In this case, we are bound by certain rules (principles), which help with negative or positive response. These rules are summarised in the table below:

**Multiplication**

| Positive x Positive = Positive |
| Positive x Negative = Negative |
| Negative x Negative = Positive |
| Negative x Positive = Negative |

**Division**

| Positive ÷ Positive = Positive |
| Positive ÷ Negative = Negative |
| Negative ÷ Negative = Positive |
| Negative ÷ Positive = Negative |

**BODMAS**

It is possible to have many operations in one problem. We do have to apply a rule that deals with calculating these operations. This rule is called the BODMAS rule.

- **Brackets**: Calculations in brackets first
- **O**f: Do all operations that have the word of in i.e. \( \frac{1}{2} \) of 8.
- **D**ivision: Do all the calculations that require division
- **M**ultiplication: Do all the multiplication calculations
- **A**ddition: The next step is to do all the addition calculations.
- **S**ubtraction: Finally, we complete the calculation that requires subtraction.
1.2 Working with Irrational Numbers

a) Approximation and Estimation

When we are working with irrational numbers, it is impractical and impossible to calculate the exact answer, because an irrational number has no end ... it continues into infinity. The only way to calculate with irrational numbers is to round off the irrational number to the nearest sensible decimal point.

Estimation helps us to guess the closest possible answer, without doing the actual calculation.

Example:
Sam buys a television set for R1 699-00. When John visits Sam, he sees the new television set.

How much did you pay for this new TV?

I paid R1 700 for it.

Sam rather rounds off the price of the television set to the nearest figure, than saying “I paid one thousand six hundred and ninety nine rand for it”.

Rounding off is a practical way of using numbers when it is not important to know the exact answer.

We usually round off numbers to the closest significant number.

Example:

a) \[1\quad 2\quad 3\quad 4\quad 5\quad 6\quad 7\quad 8\quad 9\quad 10\]

7 is closer to 10 than it is to 1

b) \[50;51;52;53;54;55;56;57;58;59;60\]

54 is closer to 50 than it is to 60

c) 199 is closer to 200 than it is to 100

d) 486 is closer to 500 than it is to 400

e) 835 is closer to 800 than it is to 900
Example:
Edgars is having a sale where we can save $33\frac{1}{3}\%$ of all jeans and T-shirts. We want to buy two pairs of jeans (usually R89.99) and 2 T-shirts (normal price R49.99). We have about R200 to spend.

It is impossible to calculate $33.33333333333333333333333333333333\ldots$ (into infinity) of R89.99 or any other amount for that matter, but if we round off the $33.33333333\ldots$ then we are closer to a workable solution.

We round off by looking at the very last digit after the decimal, which in this case is 3. Three is smaller than 5, therefore it is rounded off to zero and we can continue until we get to 33.3. Alternatively, you could look at the 3rd digit to the left of the decimal point and rounded off from there.

Now we can calculate the discount at the Edgars sale.

Jeans
\[
(2 \times R90) \times 33.3\% = R180 \times (33.3 \div 100) = R60
\]
\[
(2 \times R90) \text{ less } 33.3\% = R180 - R60 = R120
\]

T-shirts
\[
(2 \times R50) \times 33.3\% = R100 \times (33.3 \div 100) = R33
\]
\[
(2 \times R50) \text{ less } 33.3\% = R100 - R33 = R67
\]

Total
\[
R120 + R67 = R187
\]

Please complete Activity 1 at the end of this session.
Demonstrate understanding of rational and irrational numbers and number systems

Primary Agriculture  
NQF Level 2  
Unit Standard No: 7480

Activity 1

### Instructions:
**Calculate and Estimate**

1. Calculate rational and irrational numbers with and without the use of technology

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 34 + 54</td>
<td></td>
</tr>
<tr>
<td>2. 432 - 324</td>
<td></td>
</tr>
<tr>
<td>3. 748 ÷ 3</td>
<td></td>
</tr>
<tr>
<td>4. 230 × 84</td>
<td></td>
</tr>
<tr>
<td>5. (4890 - 342 ÷ 7)</td>
<td></td>
</tr>
<tr>
<td>6. 2 - 34</td>
<td></td>
</tr>
<tr>
<td>7. 9 - (74 + 63)</td>
<td></td>
</tr>
<tr>
<td>8. (9 - 74) + 63</td>
<td></td>
</tr>
<tr>
<td>9. 475 × 56</td>
<td></td>
</tr>
<tr>
<td>10. 7456 ÷ 4329</td>
<td></td>
</tr>
<tr>
<td>11. (9787 ÷ 87) × 2</td>
<td></td>
</tr>
<tr>
<td>12. 324 ÷ 43</td>
<td></td>
</tr>
<tr>
<td>13. (9800 ÷ 0) × (3 + 329920)</td>
<td></td>
</tr>
<tr>
<td>14. 43290 ÷ 10 000</td>
<td></td>
</tr>
<tr>
<td>15. (898923 ÷ 3) × (432 ÷ 3) + (24 - 74)</td>
<td></td>
</tr>
</tbody>
</table>

My Name:  
My Workplace:  
My ID Number:  

2. Estimate the following answers and round off to the nearest round figure

1. 54 + 78

2. 96 – 23

3. 5,126954 x 4,5

4. 25% of R39,99

5. 33⅓ % of R399,99

6. ⅛ x 54

7. 0,83 of 500

8. 3/100 x 500

9. 15% of 24500

Facilitator comments:

Assessment:
<table>
<thead>
<tr>
<th>Concept (SO 1)</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computational tools are used efficiently and correctly and solutions obtained are verified in terms of the context or problem.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algorithms are executed appropriately in calculations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solutions involving irrational numbers are reported or recorded to degrees of accuracy appropriate to the problem.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurements are reported or recorded in accordance with the degree of accuracy of the instrument used.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimates and approximations are used appropriately in terms of the situation and distinctions are made between the appropriate use of estimates versus approximations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The roles and limitations of particular algorithms are identified in terms of efficiency and the complexity of the algebraic formulation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The viability of selected algorithms is verified and justified in terms of appropriateness to context and efficiency.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Session 2

Representations of Rational and Irrational Numbers

After completing this session, you should be able to:
SO 2: Demonstrate understanding of numbers and relationships among numbers and number systems.

In this session we explore the following concepts:
- Work with percentages, common fractions, decimal fractions, exponential notation
- Convert common fractions to decimal fractions
- Write rational numbers in exponential notation
- Calculate and justify procedures when calculating

In this session, we explain how to work with irrational numbers that are related to different fractions

My Notes ...

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1. **Percentages**

This is a commonly used fraction, often seen in economic, social and political fields.

Percentage is **always** indicated by the symbol %. It is a fraction with a special denominator of 100 i.e. $10\% = \frac{10}{100}$.

The proper fraction $\frac{1}{2}$ will be equivalent to 50%, since 50 is half of a hundred.

\[
\frac{1}{2} = \frac{1 \times 5}{2 \times 5} = \frac{5 \times 10}{10 \times 10} = \frac{50}{100}
\]

*If you look at the sign we use to show percentage i.e. %, you will see that it automatically tells you that this number is ‘out of one hundred’. The illustration on the left demonstrates it.*
3. **Decimal Fractions**

When the denominator is divided into the numerator, a decimal fraction may occur. Every fraction can be written as a decimal fraction i.e. \( \frac{1}{2} \).

\[
\begin{array}{c|cc}
\text{2} & 1 & 0 \\
\hline
1 & 1 & 0 \\
\hline
0 & & \text{Remainder}
\end{array}
\]

Decimals can assist us in finding smaller parts of whole numbers and are easier to use to express more accurate answers. Decimals are always written as a fraction in multiples of 10.

**Example:**

Find the smaller values between 4 and 5.

We split the numbers into 10 smaller parts.

<table>
<thead>
<tr>
<th>Mixed Fraction</th>
<th>4; 4(\frac{1}{10}); 4(\frac{2}{10}); 4(\frac{3}{10}); 4(\frac{4}{10}); 4(\frac{5}{10}); 4(\frac{6}{10}); 4(\frac{7}{10}); 4(\frac{8}{10}); 4(\frac{9}{10}); 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decimal Fraction</td>
<td>4.0; 4.1; 4.2; 4.3; 4.4; 4.5; 4.6; 4.7; 4.8; 4.9; 5.0</td>
</tr>
</tbody>
</table>

We can then split the number between 4.2 and 4.3 into another ten smaller parts.

<table>
<thead>
<tr>
<th>Mixed Fraction</th>
<th>4; 4(\frac{1}{100}); 4(\frac{2}{100}); 4(\frac{3}{100}); 4(\frac{4}{100}); 4(\frac{5}{100}); 4(\frac{6}{100}); 4(\frac{7}{100}); 4(\frac{8}{100}); 4(\frac{9}{100}); 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decimal Fraction</td>
<td>4.20; 4.21; 4.22; 4.23; 4.24; 4.25; 4.26; 4.27; 4.28; 4.29; 4.30</td>
</tr>
</tbody>
</table>
Demonstrate understanding of rational and irrational numbers and number systems

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Place after Decimal Comma | Represents fraction
---|---
1 | \( \frac{1}{10} \)
2 | \( \frac{1}{100} \)
3 | \( \frac{1}{1000} \)
4 | \( \frac{1}{10000} \)
5 | \( \frac{1}{100000} \)
6 | \( \frac{1}{1000000} \)
7 | \( \frac{1}{10000000} \)

4. **Exponential notation**

We have already seen that \( x \cdot x \cdot x = x^3 \) or \( p^4 = p \cdot p \cdot p \cdot p \).

Of course these systems originated many centuries ago and was originally introduced for dealing with ordinary numbers. e.g.

(i) A short way of dealing with \( 3 + 3 + 3 = 12 \) would be \( 4 \times 3 = 12 \).

(ii) A short way of dealing with \( 3 \cdot 3 \cdot 3 = 27 \) would be \( 3^3 = 27 \).

When applied in algebra the “laws of exponents” were formed.

Definition

Exponent or index

\[ a^m = a \cdot a \cdot a \cdot \ldots \quad \text{to} \quad m \quad \text{factors (or terms) of} \quad a \]

Operations involving variables and numerals give a concept called a **term**. The following basic understanding should be applied when creating terms:

- \( a + a + a = 3a \) (same variables can be added together)
- \( 7b - 2b = 5b \) (same variables can be subtracted together)
- \( 3 \times a = 3a \) and
- \( -5 \times x = -5x \) (constant can be multiplied with a variable to form 1 term)
- \( a + 3b = a + 3b \); again
Let’s look at the laws of indices in a more general way.

1. \( a^m \times a^n = a^{m+n} \)
   (When multiplying powers of the same base we simply add indices)
   
   e.g. \( \frac{2^4 \times 2^2}{3^2 \times 3^2} = \frac{2^{4+2}}{3^{2+2}} = \frac{2^6}{3^4} = \frac{(3 \times 3)(3 \times 3)(3 \times 3)}{3^4} = \frac{3^3}{3^4} = \frac{3^3}{3^4} \)

2. \( a^m \div a^n = a^{m-n} \)
   (When dividing powers of the same base, we simply just subtract exponents from each other)

   e.g. \( \frac{2^5}{2^3} = \frac{2^5}{2^3} = \frac{2 \times 2 \times 2 \times 2 \times 2}{2 \times 2 \times 2} = \frac{2 \times 2}{2} = 2 \)

3. \( (a^n)^m = a^{n \times m} \)
   e.g. \( (2^2)^3 = 2^2 \times 2^2 \times 2^2 = 2^{2+2+2} = 2^6 = 2^{2 \times 3} \)

4. \( a^{-b} = a^{\frac{1}{b}} \)
   e.g. \( \frac{5^2}{2^3} = \frac{5^2}{2^3} = \frac{5}{2^3} = \frac{5}{2^3} = \frac{5}{2^3} \)

   (A negative exponent is also possible)
Demonstrate understanding of rational and irrational numbers and number systems

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- \( a^{\frac{1}{2}} = \sqrt{a} \)
  - i.e. square root
  - e.g. \( 9^{\frac{1}{2}} \Rightarrow \sqrt{9} = 3 \)
  - because \( 3 \times 3 = 9 \)
  - and \( (-3 \times -3) = 9 \)

- \( a^0 = 1 \), where \( a \neq 0 \).
  - When you add or subtract indices, you could sometimes get an answer with an index of zero.
  - Example, \( 25 + 25 = 5^{2-2} = 5^0 \), but clearly \( \frac{5^2}{5^2} = 1 \). This rule is only true if the base is not a zero (remember the important general rule: ‘thou shalt not divide by zero’).

5. Conversion of fractions

As you can see, it is possible to change fractions from one type to another i.e. changing \( \frac{3}{4} \) into a decimal fraction, by dividing 4 into 3, gives you 0.75:

\[
\begin{array}{c|c}
4 & 0.75 \\
\hline
3.0 & \\
2.8 & \\
20 & 0 \\
20 & \\
0 & \\
\end{array}
\]

To change 0.75 to a proper fraction, you need to know that 0.75 actually stands for \( \frac{75}{100} \). (Remember that we divided the smaller parts between two whole numbers into 10 and then again into 10, which means we divided it into 100.) When we simplify \( \frac{75}{100} \) we get \( \frac{3}{4} \), because we divided 75 by 25 and 100 by 25.

If you know how to change fractions from one type to another, you will be able to compare fractions more easily and be able to convert them in order to perform calculations.

Example: Which is the larger fraction between 0.35 and \( \frac{5}{6} \)?

Convert \( \frac{5}{6} \) to a decimal fraction:

\[
\begin{array}{c|c}
8 & 0.625 \\
5.0 & \\
4.8 & \\
20 & \\
16 & \\
40 & \\
40 & \\
0 & \\
\end{array}
\]

Therefore: \( 0.625 > 0.35 \)
Let’s take a closer look: \(0.625 > 0.35\)

If we convert the decimal fractions to proper fractions, we will have this:

\[
\frac{625}{1000} > \frac{35}{100}
\]

The denominator in \(\frac{625}{1000}\) is 1000 (thousandths).
Which says: there are 625 pieces of 1000 pieces.

The denominator in \(\frac{35}{100}\) is 100 (hundredths).
Which says: there are 35 pieces of 100.

Can you see that in this case, \(\frac{625}{1000}\) is a bigger part than \(\frac{35}{100}\), although \(\frac{35}{100}\) are larger parts of the whole and \(\frac{625}{1000}\) are smaller parts of the whole?

### Adding and Subtracting with Fractions

The processes of adding and/or subtracting fractions are simple if the denominators are the same.

**Example:**

\[
\frac{1}{4} + \frac{2}{4} = \frac{3}{4}
\]

\[
\frac{1}{8} + \frac{6}{8} = \frac{7}{8}
\]

However, sometimes the denominator is not the same and it is then that we need to develop a **common denominator**.

I multiply the fraction so that it has the same denominator as the fraction to which I must add it. What I do at the top, I must do at the bottom.

**Example:**

\[
\frac{1}{2} + \frac{1}{4} = \frac{1 \times 2}{2 \times 2} + \frac{1}{4}
\]

\[
= \frac{2}{4} + \frac{1}{4}
\]

\[
= \frac{3}{4}
\]
Demonstrate understanding of rational and irrational numbers and number systems

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The lowest common multiple (LCM) of 3 and 8 is 24; therefore I multiply the top and bottom of the first fraction with 8 and the second fraction with 3 to make the denominators the same.

\[
\frac{1}{3} + \frac{6}{8} = \frac{1 \times 8}{3 \times 8} + \frac{6 \times 3}{8 \times 3}
\]

\[
= \frac{8}{24} + \frac{18}{24}
\]

\[
= \frac{26}{24}
\]

Simplify

\[
= 1 \frac{2}{24}
\]

\[
= 1 \frac{1}{12}
\]

Example:

a. Simplify: \(\frac{1}{6} + \frac{5}{12} + 2\)

The denominators are not the same. The LCM = 12. The whole 2 can be written as a fraction, by dividing it by 1.

\[
\frac{1}{6} + \frac{5}{12} + \frac{2}{1} = \frac{1}{6} + \frac{5}{12} + \frac{24}{12}
\]

\[
= \frac{1}{12} + \frac{5}{12} + \frac{24}{12}
\]

\[
= \frac{31}{12}
\]

Simplify:

\[
= 2\frac{7}{12}
\]

b. Simplify: \(3\frac{5}{9} - 1\frac{1}{3}\)

group wholes together and calculate

\[
3\frac{5}{9} - 1\frac{1}{3} = (3-1)\left(\frac{5}{9} - \frac{1}{3}\right)
\]

\[
= 2\left(\frac{5}{9} - \frac{3}{9}\right)
\]

\[
= 2 \times \frac{2}{9}
\]

The LCM of 3 and 9 is 9

Multiplication and Division of Fractions

Multiplication of fractions involve the following procedure:

**Top x Top**

**Bottom x Bottom**

The numerators are multiplied with each other and the denominators are multiplied with each other.

Examples:

a. Calculate half of half:

\[
\frac{1}{2} \times \frac{1}{2} = \frac{1 \times 1}{2 \times 2} = \frac{1}{4}
\]
Demonstrate understanding of rational and irrational numbers and number systems

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What about 10% of R25?

\[
\begin{array}{ccl}
10 & \times & 2.5 \\
100 & & = 250 \\
& & = \text{R}2.50
\end{array}
\]

Remember to apply the BODMAS rule at all times!

**Example:**

\[
2 \times 1.5 - (6 \div 0.3) = 2 \times 1.5 - (6 \div \frac{3}{10})
\]

Change decimal to proper fraction:

\[
= 2 \times \frac{15}{10} - \left( \frac{6}{1} \times \frac{3}{10} \right)
\]

= \[
\frac{2}{1} \times \frac{15}{10} - \left( \frac{6}{1} \times \frac{3}{10} \right)
\]

= \[
\frac{30}{10} - \frac{18}{10}
\]

= \[
\frac{3}{1} - 1.8
\]

= -1.7 remember the integers

It is possible to divide fraction by each other. Previously we calculated \( \frac{1}{2} \) of \( \frac{1}{2} \); this means \( \frac{1}{2} \) \( \times \) 2, because one half should be divided into 2 parts to create half of the half. As seen in the previous example, \( \frac{1}{2} \) of \( \frac{1}{2} \) = \( \frac{1}{4} \).

We also know that division is the inverse operation of multiplication. In other words, division is the reverse of multiplication.

This allows us to assume a new rule in division, which is that division can be converted into multiplication with an affliction of the denominator. We convert the denominator into its reciprocal (inverse).

\[
\frac{1}{2} \div 2 = \frac{1}{2} \div \frac{2}{1}
\]

\[
= \frac{1}{2} \times \frac{1}{2}
\]

\[
= \frac{1}{4}
\]

\( \frac{1}{2} \) is the reciprocal or inverse of \( \frac{2}{1} \)

**Example:**

How many small packets of 0.75g can be made from a big pack of 12g?

\[
12 \div 0.75 = 12 \div \frac{75}{100}
\]

= \[
12 \div \frac{3}{4}
\]

= \[
12 \times \frac{4}{3}
\]

= \[
48 \div \frac{1}{3}
\]

= \[
16
\]

\( \frac{3}{4} \) is a simplified fraction of \( \frac{75}{100} \)

Therefore: 16 small packets can be made from one big pack.
Please complete Activity 2 & 3 at the end of this session.

### Concept (SO 2)
- Notation for expressing numbers is consistent with mathematical conventions.
- Methods of calculation and approximation are appropriate to the problem types.
- Numbers and quantities are represented using rational and irrational numbers as appropriate to the context.

<table>
<thead>
<tr>
<th>Concept (SO 2)</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notation for expressing numbers is consistent with ...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methods of calculation and approximation are ...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Numbers and quantities are ...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**My Notes ...**

...
1. Simplify the fractions:

1. \( \frac{9}{12} \)
2. \( \frac{16}{32} \)
3. \( \frac{21}{49} \)
4. \( \frac{18}{81} \)
5. \( \frac{36}{48} \)
6. \( \frac{88}{112} \)
7. \( \frac{78}{88} \)
8. \( \frac{91}{114} \)
9. \( \frac{1120}{1500} \)
10. \( \frac{35}{77} = \frac{5}{11} \)
11. \( \frac{45}{65} \)
12. \( \frac{17}{23} \)

Instructions:

My Name: 

My Workplace: 

My ID Number: 

Calculate and convert
2. Convert the following into percentage:

1. \( \frac{1}{4} \)
2. \( \frac{6}{25} \)
3. \( \frac{9}{27} \)
4. \( 0.675 \)
5. \( 1.534 \)

3. Convert the following fractions to decimal fractions:

\[
\begin{align*}
1 & \quad \frac{1}{5} \\
2 & \quad \frac{6}{10} \\
3 & \quad \frac{12}{16} \\
4 & \quad \frac{13}{27}
\end{align*}
\]
4. Calculate the following:

a. $\frac{3}{4} + \frac{1}{2}$
b. $\frac{1}{2} + \frac{1}{4}$
c. $\frac{7}{8} - \frac{3}{5}$
d. $\frac{11}{2} - \frac{1}{3}$
e. $\frac{15}{4} + 3\frac{2}{3}$
f. $\frac{1}{4} \times \frac{1}{2}$
g. $\frac{1}{4} \times 3\frac{1}{4}$
h. $\frac{1}{2} \div \frac{7}{8}$
i. $\frac{10}{15} \div \frac{1}{3}$
j. $\frac{14}{32} \div \frac{19}{5}$

k. If a field is divided into 8 equal sections, and 5 sections are planted with cotton, what fraction of the field has cotton growing on it?

l. What is $\frac{5}{6}$ of R120?

m. How far is $\frac{2}{3}$ of 42 km?

n. $\frac{1}{5}$ of 965 workers are absent because of taxi strikes.

a. How many workers are absent?

b. How many workers are at work?

o. $\frac{3}{5}$ of a sum of money is R 80.

a. How much is $\frac{1}{5}$ of the sum of money?

b. What is the total sum of money?

p. A farmer buys a bull weighing 360 kg. A month later the bulls weight has increased by $\frac{1}{12}$. How much does the bull weigh now?

q. At a cattle sale a bull worth R 5400 is sold at $\frac{2}{3}$ of its value. What was the sale price of the bull?

r. A farmer went to town to buy boots for R200. He spent R150 on petrol. After this he found that only $\frac{2}{5}$ of the money he had originally was left. How much money did have originally?

s. While Samuel was on leave he decided to buy a bakkie in Port Elizabeth. An eighth of his leave was spent traveling, half of his leave was spent in Port Elizabeth and the rest of the time was spent at home. If the time spent at home was 4 days, how much leave did he take?
1. Work out the answers without using a calculator

   a. \((5/8 + 2/3) \times (1/3 \times 1/2)\)
   
   b. \(3/4 + 1/4 \times (1/2 \text{ of } 2)\)
   
   c. \(3 + 7/8 - (1/8 \times 0.5)\)
   
   d. \(1/4 + 1/4 \text{ of } (9 \times 2 \div 3 + 3 - 1)\)
   
   e. \((72 - 6) \div 8 \times 2 + 9 - 7\)
   
   f. What \(1/3\) of 36 added to \((36 - 12)\) and divided by \(3 + 15 - 6\)
2. Simplify the following:
   1. \(3^3 \times 3^5 \times 3^9 \div 3^4\)
   2. \((5^25^2)^2 + (3^4 \div 3)^4\)
   3. \(3^5\)
   4. Which is the larger fraction?
      a) 0.379 or \(\frac{3}{8}\)
      b) 0.856 or \(\frac{4}{7}\)

3. Simplify the following:
   1. \(5a + 2b + c + 3a + 5b + 2c\)
   2. \(4y - 2x - 4x - 2y\)
   3. \(14m + 7n - 2mn + n\)
   4. \((3a + 6b) - (-3a - 6b)\)
   5. \((24b + 14d - 10) \div 2\)
   6. \(6ab + 6ac + 6ac - 6ab\)
   7. \(3(2a - 3b + c)\)
   8. \(16p - p\)
   9. \(24k + 4\)
   10. \(4rs - 4r + 5rs + 10r\)
   11. \((55abc + 22ab) \div 11\)
   12. \((4m - 4n) - (-5m + 6n)\)
<table>
<thead>
<tr>
<th>Facilitator comments:</th>
<th>Assessment:</th>
</tr>
</thead>
</table>

| Demonstrate understanding of rational and irrational numbers and number systems |
| Primary Agriculture | NQF Level 2 | Unit Standard No: 7480 |

Version: 01    Version Date: July 2006
Session 3 Scientific Notation

After completing this session, you should be able to:
SO 2: Convert very large and very small numbers to scientific notation
Apply the mathematical principles involved when applying scientific notation

In this session we explore the following concepts:
♦ Scientific notation
♦ Writing large numbers in scientific notation
♦ Convert small numbers to scientific notation

This session will assist you in simplifying your workings with very small and very large numbers.

My Notes ...
1. **Scientific Notation**

Scientific notation is just another way of writing very large or very small numbers.

If we are working with measurements that are very small, but has to be very accurate, it will become really difficult writing out something like 0.0000001 every time and what will happen if you leave out or put in a zero; it will mess up the entire accuracy of the measurement.

This is where scientific notation solves some problems for us.

2. **Writing Large Numbers in Scientific Notation**

It is often useful, particularly in Science, to be able to rewrite very large numbers in a different form, called Scientific Notation. e.g.

Example:

\[ 2 \, 560 \, 000 \, 000 \quad = \quad 2.56 \times 10^9 \]

In this example, the comma is moved 9 places to the left and this is indicated by the \(9\) in \(10^9\).

When dealing with a number such as 2 000 000 in a problem it is easy to miss one of the 0's.

We re-write the number as follows:

**Answer:**

\[ 2 \, 000 \, 000 = 2 \times 1 \, 000 \, 000 \]

\[ = 2 \times 10^6 \]

and this is known as Scientific Notation.

Example:

Write 5 000 000 000 in Scientific notation:

**Answer:**

\[ 5 \, 000 \, 000 \, 000 = 5 \times 1 \, 000 \, 000 \, 000 \]

\[ = 5 \times 10^9 \]

Example:

Write \(2.76 \times 10^6\) as an ordinary number:

**Answer:**

\[ 2.76 \times 10^6 = 2.76 \times 1 \, 000 \, 000 \]

\[ = 2 \, 760 \, 000 \]

3. **Convert very small numbers to scientific notation**

It is even more difficult to calculate with smaller numbers.

Example:

\[ 0.00445 \quad = \quad 4.45 \times 10^{-3} \]

You need at least one significant digit (not zero) in front of the comma. In this case, the comma is moved 3 places to the right. These 3 places are indicated by the \(-3\) seen in \(10^{-3}\).
### How am I doing?

<table>
<thead>
<tr>
<th>Concept (SO 2)</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific notation is used appropriately and consistently with conventions. Situations for the use of scientific notation are provided and described in terms of advantages.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conversions between numbers expressed in different ways are accurate.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

My Notes ...

Please complete Activity 4 & 5 at the end of this session.
### Instructions:
Rewrite and simplify

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>3 687 834</td>
</tr>
<tr>
<td>b</td>
<td>234 984</td>
</tr>
<tr>
<td>c</td>
<td>996 000 007</td>
</tr>
<tr>
<td>d</td>
<td>756 000 000</td>
</tr>
<tr>
<td>e</td>
<td>0,009</td>
</tr>
<tr>
<td>f</td>
<td>147,235654000</td>
</tr>
<tr>
<td>g</td>
<td>0,005648</td>
</tr>
<tr>
<td>h</td>
<td>0,00006002</td>
</tr>
<tr>
<td>i</td>
<td>456,456</td>
</tr>
<tr>
<td>j</td>
<td>831 563 000 000</td>
</tr>
</tbody>
</table>
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2. Rewrite these in Ordinary Numbers

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>7,413 x 10^6</td>
</tr>
<tr>
<td>b</td>
<td>7,524 x 10^-3</td>
</tr>
<tr>
<td>c</td>
<td>6.14 x 10^-9</td>
</tr>
<tr>
<td>d</td>
<td>0.7 x 10^7</td>
</tr>
<tr>
<td>e</td>
<td>3,027 x 10^2</td>
</tr>
<tr>
<td>f</td>
<td>0.324 x 10^3</td>
</tr>
<tr>
<td>g</td>
<td>8,791 x 10^-2</td>
</tr>
<tr>
<td>h</td>
<td>5,212 x 10^4</td>
</tr>
</tbody>
</table>

3. Simplify the following without using a calculator

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>3.6 x 10^4 x 3 x 10^2</td>
</tr>
<tr>
<td>b</td>
<td>4.25 x 10^-8 x 5 x 10^7</td>
</tr>
<tr>
<td>c</td>
<td>1.98 x 10^8 x 6 x 10^9</td>
</tr>
<tr>
<td>d</td>
<td>1.05 x 10^-2 x 6.4 x 10^4</td>
</tr>
<tr>
<td>e</td>
<td>7.34 x 10^6 x 5.24 x 10^-1</td>
</tr>
</tbody>
</table>
1. In January Zondi’s farm makes a profit of R3 600 in the State Lottery. He decides to share his profits with his brothers and sisters. He keeps one third for himself, gives one fifth to each of his two brothers and the remainder to his two sisters, equally shared.

   a What fraction does each of his sisters receive?

   b How much does each member of the family receive?

2. Calculate the following:
   a  \(-27 + 36 - 52 + 18\)
   b  \(-12 - 8\)
   c  \(-45 ÷ -9\)
   d  The temperature one morning in Dorpfontein is \(-5^\circ\)C. The temperature at midday rises by \(10^\circ\)C and by 7pm that evening it has dropped by a further \(12^\circ\)C. What was the temperature at:
      ii midday?
      iii At 7 pm in the evening?
3. Paul buys the following at the local Co-op.

- 2.5 l cattle dip @ R 150.39 per litre
- 2 l weed killer @ R 59.59 per litre
- 4 bags fertiliser @ R 25.99 per bag
- 2 m wire mesh @ R 61.89 per m
- One packet of seeds @ R 10.79

What is the estimated total amount of money he needs? Round off to the nearest R1.

What is the estimated total amount of money he needs? Round off to the nearest R10.

What is the estimated total amount of money he needs? Round off to the nearest R100.

4. Calculate the following:

a. \( \frac{73 297}{4} \)

b. \( 21 592 \times 542 \)

c. \( \frac{99.97}{7} \)

d. \( \left( \frac{1 132}{3} \right) \times \left( \frac{5}{10} \right) \)

e. \( \frac{-14 973}{-4} \times -2 \)
5. Calculate the following:
   
   a) 37\% of R 750  
   b) One fifth of R 927  
   c) 0.347 of R 84 975  
   d) One quarter of R 648  
   e) 29.5\% of R 212  
   f) \( \frac{10}{7} \times 362 \)  
   g) \( \frac{427}{100} \times 3 \cdot \frac{37}{100} \)

6. Simplify the following:

   a) \( 3a + 4a + 3a + 2b + c + 7a \)

   b) \( 7x + 3y - 4x - 2y \)

   c) \( \frac{(13a + 2b + 4c -5a + 6b +4c)}{4} \)

   d) \( x - 10 - y \)
7. Simplify the following exponents

   a) \(3^{4^2} 3^{-4}\)

   b) \(144^{\frac{1}{2}}\)

   c) \(9^{-2}\)

   d) \((a^3 b^2 c^4)(a^4 b^6 c^2)\)

8. Calculate the following:

   \(\frac{1}{2} of \frac{1}{3}\)

   \(\frac{1}{3} of \frac{1}{2}\)

   79% of \(\frac{2}{3}\)

9. Write the following in scientific notation:

   a) 45 670 000 000 000

   b) 45,670

   c) 0,4567

   d) 0,00004567
10. Convert to ordinary numbers

a. \(3 \times 10^4\)

b. \(0,5 \times 10^9\)

c. \(3,27 \times 10^{11}\)

d. \(519,24 \times 10^4\)

e. \(67,01 \times 10^7\)

11. Simplify the following without using a calculator

a. \(5,25 \times 10^4 \times 2,25 \times 10^2\)

b. \(2,13 \times 10^{-5} \times 1,21 \times 10^4\)

c. \(171 \times 10^5 \times 1,4 \times 10^{-2}\)

d. \(0,309 \times 10^8 \times 32,14 \times 10^{-4}\)

e. \(1,52 \times 10 \times 3,4 \times 10^{-2}\)
Am I ready for my test?

- Check your plan carefully to make sure that you **prepare in good time**.
- You have to be found **competent** by a qualified **assessor** to be declared competent.
- Inform the assessor if you have any **special needs** or requirements **before** the agreed date for the test to be completed. You might, for example, require an interpreter to translate the questions to your mother tongue, or you might need to take this test orally.
- Use this worksheet to help you prepare for the test. These are **examples of possible questions** that might appear in the test. All the information you need was taught in the classroom and can be found in the learner guide that you received.

1. I am sure of this and understand it well
2. I am unsure of this and need to ask the Facilitator or Assessor to explain what it means

<table>
<thead>
<tr>
<th>Questions</th>
<th>1. I am sure</th>
<th>2. I am unsure</th>
</tr>
</thead>
</table>
| 1. Calculate the following with the use of a calculator. Give answers correct to two decimal places.  
   a 72 x 4,05  
   b (0,576 – 0,532) x 67  
   c {(2190 – 3142 ) ÷ 5}  
   d (9800 ÷ 0) x (3 + 329920)  
   e 705 + 3 x 2 | | |
| 2. Estimate the following to the nearest whole number  
   a 1/4 of 25,55  
   b 0,57 of 425  
   c 25% of 786  
   d 0,2 x 399  
   e 789 + 1255 | | |
| 3. Express the fractions in their simplest form  
   a 24/36  
   b 17/35  
   c 2 60/120 | | |
| 4. Convert the following decimals to a percentage  
   a 15/40  
   b 7/38  
   c 120/60 | | |
### 5. Calculate the following:
- **a** $\frac{1}{4} \times \frac{3}{4}$
- **b** $\frac{1}{4}$ of 596
- **c** $\frac{1}{2} + \frac{1}{4}$
- **c** $\frac{3}{20} - \frac{3}{10}$
- **d** $\frac{15}{35} \div \frac{9}{5}$

### 6. Calculate the following:
- **a** 62.5% of 8 000 km
- **b** $\frac{2}{3}$ of R120
- **c** If $\frac{2}{3}$ of a sum of money is R90, what was the original sum of money?

### 7. Use scientific notation to calculate the following:
- **a** $960 000 \times 560 000 000 000$
- **b** $2,3 \times 10^6 \times 4 \times 10^{-3}$

### 8. Simplify the following:
- **a** $3a + 4b + 5c - 6a - 7b + 8c$
- **b** $(2ab - 14bc) - (3ab + 7bc)$
- **c** $(24m + 15n - 21) \div 3$
- **d** $17m - m$
- **e** $31p + 5$

### 9. Write as ordinary numbers:
- **a** $4,567 \times 10^5$
- **b** $0,56 \times 10^3$
- **c** $482 \times 10^{-4}$
- **d** $0,007 \times 10^5$
- **e** $560023 \times 10^{-2}$

### 10. Give an example of when it is convenient to use scientific notation:
Explain why you would use scientific notation in the example you have given.
Checklist for practical assessment ...

Use the checklist below to help you prepare for the part of the practical assessment when you are observed on the **attitudes** and **attributes** that you need to have to be found competent for this learning module.

<table>
<thead>
<tr>
<th>Observations</th>
<th>Answer Yes or No</th>
<th>Motivate your Answer (Give examples, reasons, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can you identify problems and deficiencies correctly?</td>
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<tr>
<td>Are you able to work well in a team?</td>
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<tr>
<td>Do you work in an organised and systematic way while performing all tasks and tests?</td>
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<tr>
<td>Are you able to collect the correct and appropriate information and / or samples as per the instructions and procedures that you were taught?</td>
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<td>Are you able to communicate your knowledge orally and in writing, in such a way that you show what knowledge you have gained?</td>
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<tr>
<td>Can you base your tasks and answers on scientific knowledge that you have learnt?</td>
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<tr>
<td>Are you able to show and perform the tasks required correctly?</td>
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<tr>
<td>Are you able to link the knowledge, skills and attitudes that you have learnt in this module of learning to specific duties in your job or in the community where you live?</td>
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</tbody>
</table>

♦ The assessor will complete a checklist that gives details of the points that are checked and assessed by the assessor.

♦ The assessor will write commentary and feedback on that checklist. They will discuss all commentary and feedback with you.

♦ You will be asked to give your own feedback and to sign this document.

♦ **It will be placed together with this completed guide in a file as part of you portfolio of evidence.**

♦ The assessor will give you feedback on the test and guide you if there are areas in which you still need further development.
Paperwork to be done ...

Please assist the assessor by filling in this form and then sign as instructed.

<table>
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<th>Learner Information Form</th>
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Bibliography

Books:


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SOUTH AFRICAN QUALIFICATIONS AUTHORITY

REGISTERED UNIT STANDARD:

Demonstrate understanding of rational and irrational numbers and number systems

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<td>2007-12-02</td>
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PURPOSE OF THE UNIT STANDARD

This unit standard will be useful to people who aim to achieve recognition at some level in Further Education and Training or to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- Use and analyse computational tools and strategies, and make estimates and approximations
- Demonstrate understanding of numbers and relationships among numbers and number systems, and represent numbers in different ways.

LEARNING ASSUMED TO BE IN PLACE AND RECOGNITION OF PRIOR LEARNING

The credit value is based on the assumption that people starting to learn towards this unit standard are competent in Mathematics and Communications at NQF level 1.

UNIT STANDARD RANGE

This unit standard covers:

- Approximation in relation to the use of computing technologies, the distinction between exact and approximate answers in a variety of problem settings and measurement error in relation to the accuracy of instruments

More detailed range statements are provided for specific outcomes and assessment criteria as needed.

Specific Outcomes and Assessment Criteria:
SPECIFIC OUTCOME 1
Use and analyse computational tools and strategies, and make estimates and approximations.

OUTCOME RANGE
This outcome includes the need to:
• use technology such as calculators
• demonstrate understanding of mathematical relationships and principles involved in computations
• find rational approximations to irrational numbers.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
1. Computational tools are used efficiently and correctly and solutions obtained are verified in terms of the context or problem.

ASSESSMENT CRITERION 2
2. Algorithms are executed appropriately in calculations.

ASSESSMENT CRITERION 3
3. Solutions involving irrational numbers are reported or recorded to degrees of accuracy appropriate to the problem.

ASSESSMENT CRITERION 4
4. Measurements are reported or recorded in accordance with the degree of accuracy of the instrument used.

ASSESSMENT CRITERION 5
5. Estimates and approximations are used appropriately in terms of the situation and distinctions are made between the appropriate use of estimates versus approximations.

ASSESSMENT CRITERION RANGE
Technological and non-technological settings.

ASSESSMENT CRITERION 6
6. The roles and limitations of particular algorithms are identified in terms of efficiency and the complexity of the algebraic formulation.

ASSESSMENT CRITERION 7
7. The viability of selected algorithms is verified and justified in terms of appropriateness to context and efficiency.

SPECIFIC OUTCOME 2
Demonstrate understanding of numbers and relationships among numbers and number systems.

OUTCOME NOTES
Demonstrate understanding of numbers and relationships among numbers and number systems, and represent numbers in different ways.

OUTCOME RANGE
This outcome includes the need to:
• work with rational and irrational numbers
• explore repeating decimals and convert them to common fraction form
• use scientific notation for small and large numbers.
ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
1. Notation for expressing numbers is consistent with mathematical conventions.

ASSESSMENT CRITERION 2
2. Methods of calculation and approximation are appropriate to the problem types.

ASSESSMENT CRITERION 3
3. Numbers and quantities are represented using rational and irrational numbers as appropriate to the context.

ASSESSMENT CRITERION 4
4. Scientific notation is used appropriately and consistently with conventions. Situations for the use of scientific notation are provided and described in terms of advantages.

ASSESSMENT CRITERION 5
5. Conversions between numbers expressed in different ways are accurate.

ASSESSMENT CRITERION RANGE
Between decimal and scientific notation and between repeating decimals and common fractions.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS
Accreditation Option: Providers of learning towards this unit standard will need to meet the accreditation requirements of the GENFETQA.

Moderation Option:
The moderation requirements of the GENFETQA must be met in order to award credit to learners for this unit standard.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE
The following essential embedded knowledge will be assessed through assessment of the specific outcomes in terms of the stipulated assessment criteria. Candidates are unlikely to achieve all the specific outcomes, to the standards described in the assessment criteria, without knowledge of the listed embedded knowledge. This means that the possession or lack of the knowledge can be inferred directly from the quality of the candidate’s performance against the standards.

• Number systems and rational and irrational numbers
• Estimation and approximation.

Critical Cross-field Outcomes (CCFO):

UNIT STANDARD CCFO IDENTIFYING
• Collect, analyse, organise and critically evaluate information:
  Gather, organise, evaluate and interpret numerical information
• Use mathematics:
  Use mathematics to analyse, describe and represent realistic and abstract situations and to solve problems.

UNIT STANDARD CCFO COMMUNICATING
• Communicate effectively:
Use everyday language and mathematical language to describe relationships, processes and problem solving methods.

UNIT STANDARD NOTES
N/A